

What is claimed is:

1. A method of processing carrier material by heavy ion irradiation and subsequent etching process in which the ion irradiation is carried out such that the bombardment of a bundle of rays (1) of high energy heavy ions rays (1.1) onto a carrier surface (2) occurs under at least two different angles, characterized by the fact that the fluence and direction of bombardment of the heavy ion rays are selected such that a maximum number is produced of latent ion traces (3) crossing or meeting each other and of common intersections of the recesses (4) produced by a chemical etching process following the heavy ion irradiation.
2. The method of claim 1, characterized by the fact that the dimensioning of the irradiation is carried out by means of the following five parameters:
 - a) applied ion fluence;
 - b) angle of bombardment of the heavy ion rays (1.1) onto the carrier surface (2);
 - c) angle of the different bombardment directions of the heavy ion rays directed against each other;
 - d) range of the radiation in the solid material; and
 - e) influx energy or energy dissipation per unit length along the trajectories of the high-energy heavy ions penetrating into the solid material.
3. The method of claim 1 or 2, characterized by the fact that a combination takes place of collimation and blocking of heavy ion rays (1.1) for producing as large number as possible of common intersections of recesses (4) in the carrier trace foils (2) by repeated passing of the carrier trace foil (2) below an irradiation mask (5) with the ion rays (1.1) impinging on the carrier trace foil (2) during each

passing at an angle $\pm\alpha$ or $+\alpha_1/-\alpha_2$.

4. The method of one of claims 1 to 3, characterized by the fact that the heavy ions (1.1) do not permeate the carrier trace foil, i.e.
- 5 a) their ion acceleration energy is below the Bragg-Peak-energy value and their range in the solid material is insignificant; or
- b) their ion acceleration energy is selected such that it is above the Bragg-Peak-energy value for the beam interaction and that the area of the greatest energy transmission is thus within the path of the ion through the solid material, the ranges within the solids material being in that case greater to substantially greater.
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- 15 5. The method of one of claims 1 to 4, characterized by the fact that the heavy ion irradiation is carried out such that by optimally setting the dE/dx-value the conditions are satisfied for the etching of undercut recesses (4) of as far as possible frusto-conical configurations / cavities.
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6. The method of one of claims 1 to 5, characterized by the fact that the conditions of etching are selected such that in addition to other geometric structures, primarily lobular or frusto-conical etch traces are formed and that, depending upon the conditions of irradiation, a surface-depth-relief is formed which by means of undercutting and interlacing leads to a stable lasting anchoring of the cover layer to be applied.
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7. The method of claim 6, characterized by the fact that the aspect ratio A of the formed traces, i.e. the ratio of the length of the pores to the diameter of the pores, is of value $A \geq 3$ in order optimally to make possible the lasting anchoring of the cover layer on the carrier material
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(2) at the formed undercuttings and/or interlacings.

8. The method of one of claims 1 to 7, characterized by the fact that the surface-depth-relief of the carrier foil (2) possesses a fractal structure with fractal dimensions D from $2 < D < 3$ as a result of the selected processing steps during irradiation and etching.
9. An system for processing carrier material by heavy ion irradiation and subsequent etching process, wherein the heavy ion irradiation is carried out such that the bombardment of a bundle of rays (1) of high-energy heavy ions (1.1) onto a carrier surface (2) takes place under at least two angles, characterized by the fact that by means of a deceleration module (13) and the adjustment of its thickness the directed bundle of rays penetrates into the carrier material at a defined influx energy and that in this manner there is achieved a defined range and energy dissipation of the penetrating heavy ions, the stochastic formation and distribution of a maximum number of crossing or coinciding latent ion traces, or common intersection of the recesses obtained after the etching process, being set or able of being set as a function of the applied heavy ions.
10. The system of claim 9, characterized by the fact that the symmetrically or asymmetrically constructed feed system is structured as a roller system of the following construction:
- a) a deceleration module (13) arranged in the direction of the heavy ion rays (1.1) ahead of the roller system (6, 7, 8, 9, 10, 12) as well as the carrier material;
 - b) a feed roller (6) for the still not irradiated carrier foil (2) at the beginning of the processing path of the carrier foil (2);
 - c) a take-up roller (7) for the irradiated carrier foil (2) at the

end of the processing path of the carrier foil (2);

d) a deflection roller (9) arranged for vertical adjustment along a rail (12) arranged parallel to the bundle of rays of heavy ions (1); and

e) two fixing rollers (8, 9) respectively arranged between the feed roller (6) and deflection roller (9) and between the deflection roller (9) and the take-up roller (7), the fixing rollers (8, 9) and the feed roller (6) as well as the take-up roller (7) not lying in a common plane.

11. The system of claim 9 or 10, characterized by the fact that the deceleration module (13) consists of foils and that the deceleration module (13) over its longitudinal extent is provided with foils of different thicknesses to ensure for every influx angle $+\alpha_1$ or $-\alpha_2$ a desired influx value of the ions penetrating into the carrier material (2).